Application Number 10/081,220
Responsive to Final Office Action mailed May 5, 2006

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

Claim 1 (Currently Amended):   A computer-implemented method of orthodontic appliance selection, the method comprising:

providing tooth/arch model data;

defining a three-dimensional maloccluded tooth/arch model using the tooth/arch model data as a function of patient information;

presenting a user interface to receive from a user prescription data representative of user-specified desired final positions for one or more teeth of the defined three-dimensional maloccluded tooth/arch model;

providing bracket data representative of one or more parameters defining a plurality of predefined and existing orthodontic brackets; and

executing bracket selection software to select ~~for selecting~~ one or more of the plurality of predefined and existing orthodontic brackets for use in moving one or more teeth of the defined three-dimensional maloccluded tooth/arch model to the user-specified desired final positions based on at least the prescription data.

Claim 2 (Original):   The method of claim 1,

wherein selecting one or more of the plurality of predefined and existing orthodontic brackets comprises selecting one or more of the plurality of predefined and existing orthodontic brackets that move the one or more teeth of the defined three-dimensional maloccluded tooth/arch model at least close to, but not necessarily exactly to, the desired final positions represented by the prescription data; and

wherein the method further comprises repositioning the one or more teeth of the defined three-dimensional maloccluded tooth/arch model to positions based on at least bracket data representative of the selected predefined and existing orthodontic brackets.

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Claim 3 (Original): The method of claim 2, wherein the method further comprises displaying the repositioned one or more teeth of the defined three-dimensional maloccluded tooth/arch model with the selected predefined and existing orthodontic brackets.

Claim 4 (Original): The method of claim 2, wherein the method further comprises:

providing a representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in desired final positions represented by the prescription data; and

providing a representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model as repositioned for use in comparison to the representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in desired final positions represented by the prescription data.

Claim 5 (Previously presented): The method of claim 4, wherein the method further comprises receiving input from the user modifying the selection of the one or more of the plurality of predefined and existing orthodontic brackets for use in moving one or more teeth of the defined three-dimensional maloccluded tooth/arch model to the desired final positions based on the comparison.

Claim 6 (Original): The method of claim 1, wherein the method further comprises:

providing archwire data representative of one or more parameters defining a plurality of predefined and existing orthodontic archwires; and

selecting at least one of the plurality of predefined and existing orthodontic archwires for use in moving the one or more teeth of the defined three-dimensional maloccluded tooth/arch model to the desired final positions.

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Claim 7 (Original):   The method of claim 6,

wherein selecting one or more of the plurality of predefined and existing orthodontic brackets comprises selecting one or more of the plurality of predefined and existing orthodontic brackets that move the one or more teeth of the defined three-dimensional maloccluded tooth/arch model at least close to, but not necessarily exactly to, the desired final positions represented by the prescription data; and

wherein the method further comprises repositioning the one or more teeth of the defined three-dimensional maloccluded tooth/arch model to positions based on at least bracket data representative of the selected one or more predefined and existing orthodontic brackets and archwire data representative of the selected at least one predefined and existing orthodontic archwire.

Claim 8 (Original):   The method of claim 7, wherein the method further comprises displaying the repositioned one or more teeth of the defined three-dimensional maloccluded tooth/arch model with the selected one or more predefined and existing orthodontic brackets interacting with the selected at least one predefined and existing orthodontic archwire.

Claim 9 (Original):   The method of claim 7, wherein the method further comprises:

providing a representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in desired final positions represented by the prescription data; and

providing a representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model as repositioned for use in comparison to the representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in desired final positions represented by the prescription data.

Claim 10 (Original):   The method of claim 9, wherein the method further comprises modifying at least the selection of the one or more of the plurality of predefined and existing orthodontic brackets for use in moving one or more teeth of the defined three-dimensional maloccluded tooth/arch model to the desired final positions based on the comparison.

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Claim 11 (Original): The method of claim 10, wherein the method further comprises:

repeatedly providing a representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model as repositioned based on the bracket data representative of multiple modified selections of one or more orthodontic brackets for use in comparison to the representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in desired final positions represented by the prescription data; and

modifying, after each comparison, at least the selection of the one or more of the plurality of predefined and existing orthodontic brackets for use in moving one or more teeth of the defined three-dimensional maloccluded tooth/arch model to the desired final positions.

Claim 12 (Original): The method of claim 1, wherein defining the three-dimensional maloccluded tooth/arch model using the model data as a function of patient information comprises providing a user input interface to a user to allow input of one or more characteristics associated with a patient.

Claim 13 (Original): The method of claim 12, wherein the one or more characteristics comprise at least one of gender, age, race, tooth size, arch size, impression information, and arch shape.

Claim 14 (Original): The method of claim 1, wherein the one or more teeth of the defined three-dimensional maloccluded tooth/arch model comprise individual separated three-dimensional models of teeth.

Claim 15 (Original): The method of claim 1, wherein the method further comprises:

providing a representation of one or more teeth of the defined three-dimensional maloccluded tooth/arch model for a patient;

providing one or more patient images representative of the patient's actual teeth for use in comparison to the representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model; and

modifying the defined three-dimensional maloccluded tooth/arch model based on the comparison.

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Claim 16 (Original):   The method of claim 15, wherein the one or more patient images comprise at least one of two-dimensional images and three-dimensional images of one or more portions of the patient's teeth.

Claim 17 (Original):   The method of claim 1, wherein the method further comprises:

providing a representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model for a patient; and

providing a representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in desired final positions represented by the prescription data.

Claim 18 (Original):   The method of claim 17, wherein the method further comprises changing patient information or prescription data resulting in a modification to the representation of one or more teeth of the defined three-dimensional maloccluded tooth/arch model or the representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in desired final positions represented by the prescription data.

Claim 19 (Original):   The method of claim 1, wherein the method further comprises providing a representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model for a patient in desired final positions represented by the prescription data, wherein providing the representation comprises:

providing a global coordinate system on a surface of at least one archwire of the three-dimensional tooth/arch model, the archwire corresponding to an arch form of the patient;

defining a local coordinate system at a facial axis point of each tooth of the three-dimensional tooth/arch model;

placing the local coordinate system corresponding to each tooth relative to the global coordinate system to a position in the three-dimensional tooth/arch model based at least in part on the prescription data; and

attaching each tooth to the corresponding placed local coordinate system.

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Claim 20 (Original):   The method of claim 19, wherein the method further comprises repositioning the one or more teeth of the defined three-dimensional maloccluded tooth/arch model to positions based on at least bracket data representative of the selected predefined and existing orthodontic brackets, wherein the repositioning of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in positions based on at least bracket data comprises changing the placement of the local coordinate system relative to the global coordinate system for each tooth and attaching each tooth to the new placement of the local coordinate system.

Claim 21 (Original):   The method of claim 19, wherein the method further comprises repositioning the one or more teeth of the defined three-dimensional maloccluded tooth/arch model to positions based on at least bracket data representative of the selected predefined and existing orthodontic brackets, wherein the repositioning of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in positions based on at least bracket data comprises:

provide a global coordinate system on a surface of at least one archwire of the three-dimensional tooth/arch model, the archwire corresponding to an arch form of the patient;

defining a local coordinate system at a facial axis point of each tooth of the three-dimensional tooth/arch model;

placing the local coordinate system corresponding to each tooth relative to the global coordinate system to a position defined at least in part by at least the bracket data representative of the selected one or more predefined orthodontic brackets; and

attaching each tooth to the corresponding placed local coordinate system.

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Claim 22 (Original): The method of claim 19, wherein the local coordinate system for each tooth initially coincides with the global coordinate system (xyz), where x is in the direction of the archwire, y is in the occlusal direction, and z is in the lingual direction, wherein placing the local coordinate system corresponding to each tooth to a position defined at least in part by at least the prescription data comprises:

translating the local coordinate system of each tooth, relative to the global coordinate system, along the archwire based on tooth type to provide a first local coordinate system, the first local coordinate system comprising $x_1 y_1 z_1$;

rotating the first local coordinate system of each tooth such that z_1 is perpendicular to an inner surface of the archwire to provide a second local coordinate system $x_2 y_2 z_2$;

translating the second local coordinate system in the lingual direction by a distance along z_2 corresponding to the in/out of the prescription data to provide a third local coordinate system $x_3 y_3 z_3$;

rotating the third local coordinate system by an angle with respect to z_3 corresponding to angulation of the prescription data to provide a fourth local coordinate system $x_4 y_4 z_4$; and

rotating the fourth local coordinate system by an angle with respect to x_4 corresponding to a torque of the prescription data to provide a fifth local coordinate system $x_5 y_5 z_5$.

Claim 23 (Original): The method of claim 19, wherein the method further comprises:

providing archwire data representative of one or more parameters defining a plurality of predefined and existing orthodontic archwires;

selecting at least one of the plurality of predefined and existing archwires for use in moving the one or more teeth of the defined three-dimensional maloccluded tooth/arch model to the desired final positions; and

repositioning the one or more teeth of the defined three-dimensional maloccluded tooth/arch model to positions based on at least bracket data representative of the selected one or more predefined and existing orthodontic brackets and archwire data representative of the selected at least one predefined and existing orthodontic archwire.

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Claim 24 (Original): The method of claim 21, wherein the method further comprises repositioning the one or more teeth of the defined three-dimensional maloccluded tooth/arch model to positions based on at least bracket data representative of the selected predefined and existing orthodontic brackets, wherein the repositioning of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in positions based on at least bracket data comprises providing a representation of at least teeth of the selected three-dimensional tooth/arch model in positions defined by the selected prescription along with the selected predefined and existing orthodontic brackets.

Claim 25 (Original): The method of claim 24, wherein providing the representation of the selected predefined and existing orthodontic brackets comprises:

   providing a global coordinate system on a surface of an archwire of the three-dimensional tooth/arch model;

   defining a local coordinate system having an origin located on a bottom surface of a base relative to an archwire slot center of each selected predefined and existing orthodontic bracket;

   placing the local coordinate system corresponding to each of the selected predefined and existing orthodontic brackets relative to the global coordinate system to a position defined at least in part by the bracket data; and

   attaching each bracket to the corresponding placed local coordinate system.

Claim 26 (Original): The method of claim 1, wherein selecting one or more of the plurality of predefined and existing orthodontic brackets based on at least the prescription data comprises providing a user input interface to a user allowing the user to provide or modify one or more prescription bracket selection criteria, wherein the one or more prescription bracket selection criteria comprise at least one of torque, angulation, and in/out value.

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Claim 27 (Original):   The method of claim 1, wherein selecting one or more of the plurality of predefined and existing orthodontic brackets based on at least the prescription data comprises selecting one or more of the plurality of predefined and existing orthodontic brackets based on at least the prescription data and also based on an adjustment to at least one of torque or angulation due to the interaction of an archwire with slots of selected brackets.

Claim 28 (Previously presented):   The method of claim 1, wherein selecting one or more of the plurality of predefined and existing orthodontic brackets comprises selecting one or more of the plurality of predefined and existing orthodontic brackets from a database using one or more prescription bracket selection criteria, wherein the one or more prescription bracket selection criteria comprise at least one of torque, angulation, and in/out value.

Claims 29-36 (Cancelled).

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Claim 37 (Currently Amended):   A computer readable medium tangibly embodying a program executable for use in selection of orthodontic appliances, wherein the computer readable medium comprises:

means for recognizing tooth/arch model data for use in defining a three-dimensional maloccluded tooth/arch model;

user interface means for allowing a user to define a three-dimensional maloccluded tooth/arch model as a function of patient information;

user interface means for allowing a user to define prescription data representative of desired final tooth positions for one or more teeth of the defined three-dimensional maloccluded tooth/arch model;

means for recognizing bracket data representative of one or more parameters defining a plurality of predefined and existing orthodontic brackets;

means for causing the display of a representation of the desired final tooth positions for one or more teeth of the defined three-dimensional maloccluded tooth/arch model based on the prescription data;

means for executing a computer-implemented bracket selection process to select ~~for selection~~ of one or more of a plurality of predefined and existing orthodontic brackets that move the one or more teeth of the defined three-dimensional maloccluded tooth/arch model at least close to, but not necessarily exactly to, the user-defined desired final positions represented by the prescription data;

means for causing the display of the selection of the one or more of the plurality of orthodontic brackets; and

means for causing the display of a representation of one or more teeth of the defined three-dimensional maloccluded tooth/arch model in positions based on bracket data representative of the selected one or more of the plurality of predefined and existing orthodontic brackets.

Claim 38 (Original):   The medium of claim 37, wherein the patient information comprises at least one of gender, age, race, tooth size, arch size, impression information, and arch shape.

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Claim 39 (Original):   The medium of claim 37, wherein the means for causing the display of a representation of the desired final tooth positions for one or more teeth of the defined three-dimensional maloccluded tooth/arch model based on the prescription data comprises:

means for providing a global coordinate system on a surface of an archwire of the three-dimensional tooth/arch model;

means for defining a local coordinate system at a facial axis point of each tooth of the three-dimensional tooth/arch model;

means for placing the local coordinate system corresponding to each tooth relative to the global coordinate system to a position defined at least in part by the prescription data; and

means for attaching each tooth to the corresponding moved local coordinate system.

Claim 40 (Cancelled).

Claim 41 (Original):   The medium of claim 37, wherein the computer readable medium further comprises:

means for causing display of one or more teeth of the defined three-dimensional maloccluded tooth/arch model for a patient; and

means for causing the display of one or more patient images representative of the patient's actual teeth for use in comparison to the representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model.

Claim 42 (Original):   The method of claim 37, wherein the one or more teeth of the defined three-dimensional maloccluded tooth/arch model comprise individual separated three-dimensional models of teeth.

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Claim 43 (Original):   The medium of claim 37, wherein the computer readable medium further comprises means for causing the display of the representation of the selected predefined and existing orthodontic brackets, wherein the means for causing the display of the representation of the selected predefined and existing orthodontic brackets comprises:

means for providing a global coordinate system on a surface of an archwire of the three-dimensional tooth/arch model;

means for defining a local coordinate system having an origin located on a bottom surface of a base at a point relative to an archwire slot center of each selected predefined and existing orthodontic bracket;

means for placing the local coordinate system corresponding to each of the selected predefined and existing orthodontic brackets relative to the global coordinate system to a position defined at least in part by the bracket data representative of the selected predefined and existing orthodontic brackets; and

means for attaching each bracket to the corresponding moved local coordinate system.

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Claim 44 (Currently Amended):   A method of orthodontic appliance selection, the method comprising:

providing tooth/arch model data for use in defining a three-dimensional maloccluded tooth/arch model;

providing a user interface for allowing a user to define a three-dimensional maloccluded tooth/arch model as a function of patient information;

providing a user interface for allowing a user to define prescription data representative of desired final tooth positions for one or more teeth of the defined three-dimensional maloccluded tooth/arch model;

providing bracket data representative of one or more parameters defining a plurality of predefined and existing orthodontic brackets; and

executing bracket selection software to select for selecting one or more of the plurality of predefined and existing orthodontic brackets from a database for use in moving one or more teeth of the defined three-dimensional maloccluded tooth/arch model to the desired final positions based on at least the prescription data;

displaying a representation of the desired final tooth positions for one or more teeth of the defined three-dimensional maloccluded tooth/arch model based on the prescription data;

displaying a representation of one or more teeth of the defined three-dimensional maloccluded tooth/arch model in positions based on bracket data representative of the selected predefined and existing orthodontic brackets;

overlaying the representation of the desired final tooth positions for one or more teeth of the defined three-dimensional maloccluded tooth/arch model and the representation of one or more teeth of the defined three-dimensional maloccluded tooth/arch model in positions based on bracket data; and

modifying the selection of one or more of the plurality of predefined and existing orthodontic brackets from a database based on the overlaid representations.

Claim 45 (Cancelled).

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Claim 46 (Currently Amended): The method of claim ~~44~~45, wherein the method further comprises allowing the user to modify at least one of the displayed representations by selecting and dragging one of a bracket or tooth to a position.

Claim 47 (Currently Amended): The method of claim ~~44~~45, wherein the method further comprises providing sound representative of contact between teeth, between one or more teeth and one or more brackets, and/or between brackets.

Claim 48 (Currently Amended): The method of claim ~~44~~45, wherein the method further comprises providing a representation of selected predefined and existing orthodontic brackets with the representation of the one or more teeth in positions based on bracket data representative of the selected predefined and existing orthodontic brackets.

Claim 49 (Cancelled).

Claim 50 (Original): The method of claim 44, wherein selecting the three-dimensional maloccluded tooth/arch model as a function of patient information comprises providing a user input interface to the user allowing the user to input one or more characteristics associated with a patient.

Claim 51 (Original): The method of claim 50, wherein the one or more characteristics comprises at least one of gender, age, race, tooth size, arch size, impression information, and arch shape.

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Claim 52 (Currently Amended):   The method of claim 44, wherein the method further comprises:

~~providing a representation of one or more teeth of the defined three-dimensional malocclulded tooth/arch model for a patient;~~

providing one or more patient images representative of the actual teeth of the patient for use in comparison to the representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model; and

modifying the defined three-dimensional maloccluded tooth/arch model based on the comparison.

Claim 53 (Original):   The method of claim 52, wherein the one or more patient images comprise at least one of two-dimensional images and three-dimensional images of one or more portions of the patient's teeth.

Claim 54 (Original):   The method of claim 44, wherein the method further comprises:

providing a representation of one or more teeth of the defined three-dimensional malocclulded tooth/arch model;

providing a representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in desired final positions represented by the prescription data; and

changing patient information or prescription data resulting in a modification to the representation of one or more teeth of the defined three-dimensional malocclulded tooth/arch model or the representation of the one or more teeth of the defined three-dimensional malocclulded tooth/arch model in desired final positions represented by the prescription data.

Claim 55 (Currently Amended): A method of orthodontic appliance selection, the method comprising:

providing tooth/arch model data representative of at least one or more teeth;

defining a three-dimensional maloccluded tooth/arch model using the tooth/arch model data as a function of patient information;

providing prescription data representative of user-specified desired final positions for one or more teeth of the defined maloccluded tooth/arch model;

providing archwire data representative of one or more parameters defining a plurality of predefined and existing orthodontic archwires;

selecting at least one of the plurality of predefined and existing archwires for use in moving one or more teeth of the defined three-dimensional maloccluded tooth/arch model to the desired final positions;

providing bracket data representative of one or more parameters defining a plurality of predefined and existing orthodontic brackets; and

executing bracket selection software to select ~~for selecting~~ one or more of the plurality of predefined and existing orthodontic brackets for use in moving one or more teeth of the defined three-dimensional maloccluded tooth/arch model to the desired final positions based on at least the prescription data.

Claim 56 (Original): The method of claim 55, wherein selecting one or more of the plurality of predefined and existing orthodontic brackets comprises selecting one or more of the plurality of predefined and existing orthodontic brackets that move the one or more teeth of the defined three-dimensional maloccluded tooth/arch model at least close to, but not necessarily exactly to, the desired final positions represented by the prescription data; and

wherein the method further comprises repositioning the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in positions based on at least bracket data representative of the selected one or more predefined and existing orthodontic brackets and archwire data representative of the selected at least one predefined and existing orthodontic archwires.

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Claim 57 (Original): The method of claim 56, wherein the method further comprises displaying the repositioned one or more teeth of the defined three-dimensional maloccluded tooth/arch model to the desired final positions based on at least bracket data representative of the selected one or more predefined and existing orthodontic brackets interacting with the selected at least one predefined and existing orthodontic archwires.

Claim 58 (Original): The method of claim 55, wherein the method further comprises:
    providing a representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in desired final positions represented by the prescription data; and
    providing a representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model as repositioned based on at least the bracket data and the archwire data for use in comparison to the representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in desired final positions.

Claim 59 (Original): The method of claim 58, wherein the method further comprises modifying at least the selection of the one or more of the plurality of predefined and existing orthodontic brackets for use in moving one or more teeth of the defined three-dimensional maloccluded tooth/arch model to the desired final positions based on the comparison.

Claim 60 (Original): The method of claim 55, wherein defining a three-dimensional maloccluded tooth/arch model using the model data as a function of patient information comprises providing a user input interface to a user allowing the user to input one or more characteristics associated with a patient.

Claim 61 (Original): The method of claim 60, wherein the one or more characteristics comprises at least one of gender, age, race, tooth size, arch size, impression information, and arch shape.

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Claim 62 (Original): The method of claim 55, wherein the one or more teeth of the defined
three-dimensional maloccluded tooth/arch model comprise individual separated three-
dimensional models of teeth.

Claim 63 (Original): The method of claim 55, wherein selecting one or more of the plurality of
predefined and existing orthodontic brackets based on at least the defined three-dimensional
maloccluded tooth/arch model and the defined prescription data comprises providing a user input
interface to a user allowing the user to provide or modify one or more prescription bracket
selection criteria, wherein the one or more prescription bracket selection criteria comprise at least
one of torque, angulation, and in/out value.

Claim 64 (Original): The method of claim 55, wherein selecting one or more of the plurality of
predefined and existing orthodontic brackets comprises selecting one or more of the plurality of
predefined and existing orthodontic brackets based on at least the prescription data and also
based on an adjustment to at least one of torque or angulation due to the interaction of an
archwire with slots of selected brackets.

Claim 65 (Previously presented):   The method of claim 55, wherein selecting one or more of
the plurality of predefined and existing orthodontic brackets comprises selecting one or more of
the plurality of predefined and existing orthodontic brackets from a database using one or more
prescription bracket selection criteria, wherein the one or more prescription bracket selection
criteria comprise at least one of torque, angulation, and in/out value.

Claim 66 (Original): The method of claim 55, wherein the plurality of predefined and existing
orthodontic brackets comprises a plurality of predefined and existing orthodontic brackets
precoated with a precoat adhesive material.

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Claim 67 (Original):   The method of claim 55, wherein the method further comprises:

providing a representation of one or more teeth of the defined three-dimensional maloccluded tooth/arch model for a patient;

providing one or more patient images representative of actual teeth of the patient for use in comparison to the representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model; and

modifying the defined three-dimensional maloccluded tooth/arch model based on the comparison.

Claim 68 (Original):   The method of claim 67, wherein the one or more patient images comprise at least one of two-dimensional images and three-dimensional images of one or more portions of the patient's teeth.

Claim 69 (Original):   The method of claim 55, wherein the method further comprises:

providing a representation of one or more teeth of the defined three-dimensional maloccluded tooth/arch model;

providing a representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in desired final positions represented by the prescription data; and

changing patient information or prescription data resulting in a modification to the representation of one or more teeth of the defined three-dimensional maloccluded tooth/arch model or the representation of the one or more teeth of the defined three-dimensional maloccluded tooth/arch model in desired final positions represented by the prescription data.